Reuse Working Group

Co-chairs:
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7th Earth Science Data Systems Working Group Meeting
Philadelphia, PA
October 21–23, 2008

Agenda

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- Background
- Activities and Accomplishments
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  - Recommendations to Headquarters
  - Reuse Portal Web Site
  - Reuse Enablement System (RES)
  - Reuse Readiness Levels (RRLs)
  - Software Reuse Peer-Recognition Award
- Breakout Session Agenda

Members 2008 / Mailing List

- Nadine Alameh (MobiLaps / NASA GSFC)
- Stephen Berrick (NASA GSFC)
- Angelo Bertolli (Innovim / NASA GSFC)
- Corey Bettenhausen (SSAI / NASA GSFC)
- Bradford Castalia (University of Arizona)
- Victor Delnore (NASA LaRC)
- Robert Downs (CIESIN, Columbia U.)
- Yonsook Enloe (SGT Inc. / NASA GSFC)
- Stephan Falke (Washington University in St. Louis)
- Al Fleig (PITA / NASA GSFC)
- Mike Folk (NCSA)
- Ryan Gerard (Innovim / NASA GSFC)
- Larry Gilliam (Innovim / NASA GSFC)
- Emily Greene (Raytheon / NASA JPL)
- Mary Hunter (Innovim / NASA GSFC)
- Gary Jackson (University of Maryland)
- Tommy Jasmin (University of Wisconsin, Space Science Engineering Center)
- Virginia Kalb (NASA GSFC)
- Louis Kouvaris (NASA GSFC)
- Michael Leyton (Rutgers University)
- James Marshall (Innovim / NASA GSFC)
- David McComas (NASA GSFC)
- Steve Olding (Everware–CBDI / NASA GSFC)
- Shahin Samadi (Innovim / NASA GSFC)
- Mark Sherman (SGT Inc. / NASA GSFC)
- Ross Swick (NSIDC – Boulder)
- Bill Teng (SSAI / NASA GSFC)
- Curt Tilmes (NASA GSFC)
- Frederick Watson (California State University, Monterey Bay)
- Jonathan Wilmot (NASA GSFC)
- Robert Wolfe (NASA GSFC)

31 Members on the Mailing List

Background

Introduction

- About the NASA Earth Science Data Systems (ESDS) Software Reuse Working Group (WG):
  - The WG was started in 2004 to facilitate reuse of software assets within the NASA Earth science community.
  - Membership is limited to NASA-funded projects and investigators, though there have been many contributions from the general Earth science community.
  - The WG has been working to establish a “marketplace” for reusable Earth science software artifacts by working to increase the supply and availability of reusable assets.
  - Also, the WG has worked to increase the community capacity and desire for reuse by demonstrating the feasibility and value of reuse.
  - Through regular meetings of the full WG and a smaller support team, a variety of activities are performed to encourage and enable reuse.
- Goals of the Reuse WG include:
  - To spend less time, money, and effort on software development
  - To increase productivity and improve quality through reuse
  - To increase the number of available reusable assets

Reuse WG Charter Highlights

- Purpose
  - Address technical issues required to enable and facilitate reuse of software assets, including open source products, within the NASA Earth science community
- Goals
  - Demonstrate the feasibility and value of reuse
  - Increase the supply and availability of reusable assets
  - Make recognizable and easy-to-evaluate candidate reuse solutions
  - Minimize the cost of infrastructure activities to support the community's reuse activities
  - Increase community capacity and interest in reusing existing assets
  - Contribute to the removal of existing barriers to reuse
  - Recommend incentives to encourage reuse
- Scope
  - Facilitating reuse across projects and not interfering with local control of participating systems
  - Focusing on reuse process and not on technology infusion process
  - Focusing on reuse of existing assets rather than reusability of newly developed assets
  - Focusing not only on software code, but also on design artifacts (architectures, software designs, ICDs, test plans, etc.)
  - Focusing on reuse of proven operational and NASA Earth science specific software assets

Reuse WG Activities

Reuse Implementation Projects
Efforts that result in the publication or use of a reusable component

Support/Enablement Activities
Efforts that provide tools and mechanisms to enable reuse

Outreach and Education Activities
Efforts that increase community awareness and understanding of benefits, best practices, etc.

Policy Change Activities
Efforts to reduce policy barriers to reuse

Reuse Incentive Activities
Awards and structural changes that directly or indirectly encourage reuse

- Examples of work in some of these areas include:
  - Recommending that NASA create a Reuse Enablement System (repository) for Earth science reusable software assets; development of Reuse Readiness Levels
  - Creating a web site to promote and provide information about reuse
  - Providing NASA with policy recommendations to encourage reuse
  - Developing a reuse peer-recognition award

Summary of Activities

2008 Major Accomplishments

- Software Reuse Enablement System (RES)
  - Completed architecture study
  - Sent architecture study and recommendations to NASA HQ
  - Completed initial development of prototype RES for internal NASA use
  - Completed document on RES operation/maintenance policies
- Software Reuse Portal Web Site
  - Continued to maintain and update site
  - Continued to publicize site to the community
- Continued development of Reuse Readiness Levels (RRLs)
- Established software reuse peer-recognition award
- Contributed to knowledge on reuse with publications and presentations
- Continued weekly support team telecons and monthly WG telecons

2008 Goals Met

- *Reuse Enablement System*
  - Completed architecture study
  - Completed development of prototype system
  - Developed and drafted RES Policies (vetting in progress)
  - Developed and drafted RES Test Plan
- *Reuse portal*
  - Provided more content and kept up to date
  - Promoted portal to community
- *Incentives*
  - Established peer-recognition award policies and rationale
  - First recipients to be awarded this year
- *Metrics/measurement*
  - Generated/analyzed statistics for portal web site activity
- *Promote reuse*
  - Continued publishing and presenting on reuse
  - Will hold special session at AGU fall meeting
  - Developing Reuse Readiness Levels

Publications and Presentations

- 6th ESDS WG Meeting
  - 1 poster
  - 1 invited talk
- Abstracts and poster presentations
  - 2007 Fall AGU Meeting
  - 2008 Fall AGU Meeting (upcoming)
- Papers and oral presentations
  - 2008 Domain Specific Analysis and Design for Reuse (DSADR) workshop at International Conference on Software Reuse (ICSR)
    - Paper published in Frontiers of Computer Science and Technology
  - 2008 IGARSS
    - Paper published in IEEE conference proceedings
- Special sessions
  - 2008 Winter ESIP Meeting
  - 2008 Summer ESIP Meeting
  - 2008 Fall AGU Meeting

Recommendations to Headquarters

Recommendations to HQ

- Enabling Systems Recommendations (Jan. 2004)
  - NASA should establish a web-based system to facilitate cataloging and a web-based repository system for distributing reusable assets for the Earth science community.
    - Architecture study completed and submitted to HQ
    - Additional documentation being prepared (Policies, Test Plan)
  - NASA should establish a web-based information portal for the sharing and dissemination of information about software reuse practices for the Earth science community.
    - Software Reuse portal web site has been established
    - Portal web site is actively updated and maintained
- Reuse Incentives (Spring 2008)
  - NASA should recognize and officially support a Peer-Recognition Software Reuse Award operated by the Reuse WG.
    - WG has created an award at its level
    - WG is examining the possibility of a higher-level award

Software Reuse Portal Web Site

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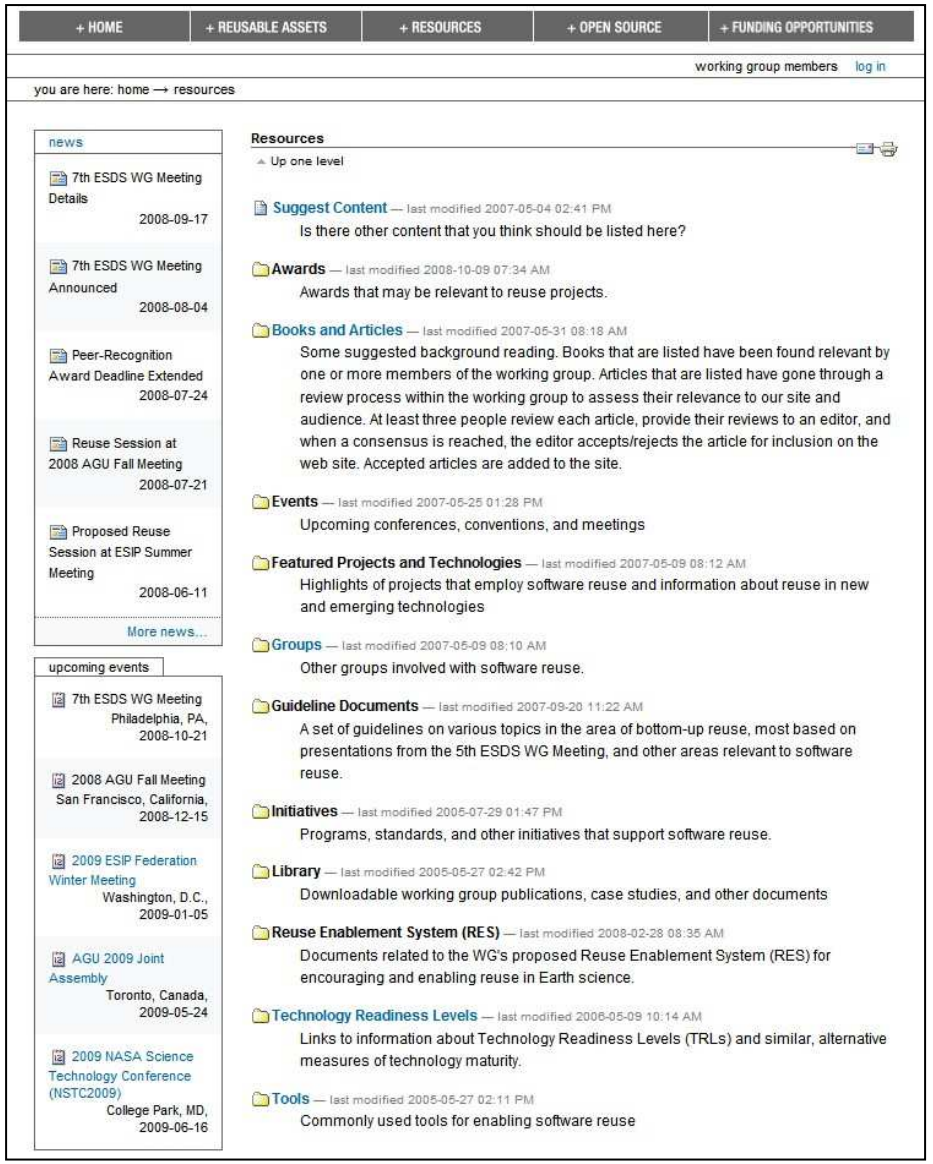
ESDS Reuse Working Group

Portal Web Site Content Status
http://www.esdswg.com/softwarereuse

- Home/News ☑☑☑
  - Latest news and information
  - Upcoming events
  - Links to important/new items
- Reusable Assets ☑☑☑
  - Links to various catalogs (e.g., GCMD, GSFC open source site)
- Open Source ☑☑☐
- Funding Opportunities ☑☐☐
  - Information about funding opportunities for reuse
- Resources ☑☑☐
  - Specific resources are shown in the screenshot.



Reuse Enablement System (RES)

RES Architecture Study

- Enabling Systems Recommendations
  - NASA should establish a system to facilitate the cataloging and distribution of reusable assets for the Earth science community.
- NASA Headquarters tasked the Working Group to look at the roles of the GCMD, Open Source Agreement site, and other sites in serving the community and meeting reuse needs.
- A trade study was conducted and concluded that none of the existing operational sites fulfilled the role of a software repository for the Earth science community.
- An architecture study was conducted by the Working Group to determine the most suitable way to create the recommended reuse catalog/repository.
  - The architecture study concluded that using the XOOPS content management system with appropriate modifications would be the best option for creating the recommended reuse enablement system.
- The WG has provided a draft to NASA Headquarters and plans to present the results.

RES Prototype Development

- Implementation of a prototype RES NASA-only system
  - Prototype would demonstrate the usefulness of the RES and its effectiveness at meeting the reuse needs of the community of Earth science software developers.
  - Three builds of the system (Sept. 2007, Oct. 2007, Dec. 2007) and one release of the complete system (spring 2008) have been completed.
  - Some additional features, such as linking of multiple versions of a single asset, are currently in alpha testing.
  - Members of the WG continue to perform informal testing of the system.
  - Formal testing of Release 1 is pending the completion of a Test Plan document, currently in progress.
- Deployment of the RES
  - WG plans to initially deploy the prototype for NASA-only use and testing in this environment.
  - Following successful NASA-only use, permission for deployment to the wider scientific software development community would be sought.

RES Policies Background

- In WG telecons and meetings discussing RES work, a number of potential policy issues were acknowledged and noted, but not explored in depth.
- After the RES prototype demonstration at the 2007 ESDS WG Meeting, much of the feedback received concerned policy issues.
  - Some of these were already recognized by the Reuse WG.
  - Others were new, and had not been considered before.
- Realizing that these policy issues must be addressed, the WG began developing a set of policies for the operation and maintenance of the proposed RES.
- Relevant requirements were considered during policy development, so that how requirements were handled was covered by the policies.

Development of Policies

The basic outline for the development of RES policies was:

- Identify areas where policies are needed
  - Requirements were considered at this step
- Discuss and agree on what the policies should be
- Draft policies for the identified areas
- Collect draft policies into a draft policy document
- Review and edit draft policy document
- Check for any gaps or inconsistencies between the policies and the requirements
- Finalize policy document on monthly WG telecon
- Review policies with ESDS WG Chair
  - Date TBD

RES Policies Outline

Definitions of User Roles
UR1.0 – User Roles
UR1.1 – Anonymous User Role
UR1.2 – Consumer Role
UR1.3 – Provider Role
UR1.4 – Content Manager Role
UR1.5 – Administrator Role
Summary of Abilities by User Role
UR2.0 – Other Roles
UR2.1 – Site Curator Role
UR2.2 – NASA ESDS Software Reuse WG Role

User Policies
U1.0 – User Statuses
U1.1 – Anonymous User Status
U1.2 – Consumer Status
U1.3 – Provider Status
U1.4 – Content Manager Status
U1.5 – Administrator Status
U2.0 – User Accounts and Groups
U2.1 – User Accounts
U2.2 – User Groups

Downloads
DL1.0 – Downloads
DL1.1 – Creating and Modifying Downloads
DL1.2 – Contributing Assets
DL1.3 – Linking of Download Versions/Modifications
DL1.4 – Deprecating Downloads
DL1.5 – Suspending Downloads
DL1.6 – Investigating Downloads
DL1.7 – Masking Downloads
DL1.8 – Deleting Downloads
DL1.9 – Prioritization of Deprecating, Masking, and Deleting
DL1.10 – Right of Administrators to Take Action
DL1.11 – Reporting Broken Downloads

Communications with the Community
C1.0 – Communications with the Community
C1.1 – Commenting on Downloads
C1.2 – Rating Downloads
C1.3 – Handling User Feedback
C1.4 – Enforcing Policies

Intellectual Property and Copyrights
IP1.0 – Intellectual Property and Copyrights
IP1.1 – Uploading Content
IP1.2 – Downloading and Using Content
IP1.3 – Open Source Software
IP1.4 – NASA Software Release Process
IP1.5 – Export Controlled Software

Privacy and Security of Information
PS1.0 – Privacy and Security of Information

Support for Users
S1.0 – Support for Users
S1.1 – Support for Consumers
S1.2 – Support for Providers

An Example Policy

Policy U1.2 – Consumer Status

An Anonymous User may become a Consumer by registering for an account on the RES and having that request approved by an Administrator. Approval is granted if the following conditions are met: a person has registered the account (no automated registrations allowed).

All Consumers must be approved by the Administrators, who have the discretion to deny any registration request.

Review of Policies

- The WG has reviewed and approved the current draft of the RES Policies document.
- To ensure that these are appropriate, the WG will also have the document reviewed by:
  - NASA Headquarters (Martha Maiden)
  - Goddard's Innovative Partnerships Program (IPP) Office (formerly the Technology Transfer Office)
  - NASA Legal Office, when/if it is deemed necessary

See our poster Wednesday afternoon for some additional information about the RES Policies.

Reuse Readiness Levels (RRLs)

Introduction to RRLs

- Issue of how to measure the maturity of software, in a reusability sense, was discussed at previous meetings.
- Having a measure of the reusability of an asset:
  - Provides potential reusers with additional information about the reuse maturity of the asset:
    - Lets them know what they're getting
    - Gives them a basic feel for what modifications may be needed
  - Helps potential reusers make better informed choices about:
    - What to reuse
    - What best meets their needs
- *This measure can be used as a piece of metadata for assets placed in the proposed RES (or anywhere else).*
- Volunteers from WG wrote up levels for particular topic areas within software reuse.
- These topic levels were combined into a single scale.

RRL Topic Areas and Levels

- Topic areas included:
  - Documentation
  - Extensibility
  - Licensing
  - Modularity
  - Packaging
  - Portability
  - Standards compliance
  - Support
  - Verification/Testing
- A scale of 1–9 was used to match the Technology Readiness Levels (TRLs) scale.
- Topic levels were combined into a single RRL scale.
- A sample RRL calculator was also developed (currently on the prototype RES) as a means to help providers and consumers rate the reusability of software assets.

- **Example from Testing/Verification**

RRL 4 – Software application tested and validated in laboratory environment

Following successful testing of inputs and outputs, the testing would include integrating an application to establish that the “pieces” will work together to achieve concept-enabling levels. This validation must be devised to support the concept that was formulated earlier and should also be consistent with the requirements of potential system applications. The validation is relatively “low-fidelity” compared to the eventual system: it could be composed of ad hoc discrete components in a laboratory; for example, an application tested with simulated inputs.

Draft RRL Summaries

RRL	RRL Summary
1	No reusability – software is not reusable (or is not recommended for reuse)
2	Initial reusability – software reuse is not practical
3	Basic reusability – software might be reusable by skilled users at substantial effort, cost, and risk
4	Reuse is possible – software might be reused by most users with some effort, cost, and risk
5	Reuse is practical – software could be reused by most users with reasonable cost and risk
6	Software is reusable – software can be reused by most users although there may be some cost and risk
7	Software is highly reusable – software can be reused by most users with minimum cost and risk
8	Demonstrated reusability – software has been reused by multiple users
9	Proven reusability – software is being reused by many classes of users over a wide range of systems

Plan to complete development of RRLs during this meeting.

Software Reuse Peer-Recognition Award

Peer-Recognition Award

- Designed by the WG to recognize the contributions and achievements of those people and projects whose efforts in the area of software reuse further the work of NASA Earth science research.
- Awards are decided annually around Sept. 1.
- Number of awards given is based on the quality of the nominations received.
- Awards may be issued in any or all of three categories:
  - Contribution
  - Utilization
  - Peer Education
- Details about the award can be found in the process document on the portal web site.

Reuse Breakout Sessions

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Meeting Agenda

Tuesday, October 21, 2008		
WHEN	WHAT	WHERE
7:30 AM	Registration	Lobby
9:00 AM	Welcome, Agenda, Logistics (Lindsay, HQ)	Plenary Hall
9:30 AM	WG Charge (Maiden, HQ)	
10:00 AM	BREAK	Lobby
10:30 AM	WG Summaries	Plenary Hall
12:00 PM	Lunch w/Speaker	TBD
12:30 PM		
1:00 PM		
1:30 PM	**Introductions, opening business**	See Room Assignments
2:00 PM	**Definitions of reuse/reusability**	
2:30 PM		
3:00 PM	**Reuse Readiness Levels**	
3:30 PM	Common BREAK	Lobby
4:00 PM	**Reuse Readiness Levels**	See Room Assignments
4:30 PM		
5:00 PM		
5:30 PM	**Invited Speaker: Bill Frakes**	

Wednesday, October 22, 2008		
WHEN	WHAT	WHERE
8:00 AM	Registration	Lobby
8:30 AM		
9:00 AM	Improving the DSWGs & Discussion of Data Life Cycle (Lynnes, GSFC)	Plenary Hall
9:30 AM		
10:00 AM	BREAK	Lobby
10:30 AM	**Discussion of data life cycle**	See Room Assignments
11:00 AM		
11:30 AM	**General Reuse Discussion with HQ**	
12:00 PM	Lunch w/Speaker	TBD
12:30 PM		
1:00 PM		
1:30 PM	**Decadal Survey Missions and the WGs**	See Room Assignments
2:00 PM		
2:30 PM		
3:00 PM	**Invited Speaker: Eduardo Almeida**	
3:30 PM	Common BREAK	Lobby
4:00 PM	Poster Session, Demos & Reception	TBD
4:30 PM		
5:00 PM		
5:30 PM		

Thursday, October 23, 2008		
WHEN	WHAT	WHERE
8:00 AM	Registration	Lobby
8:30 AM		
9:00 AM	Metrics - A Focus on new ESDSWG members/Q&A (Davis, UMD)	Plenary Hall
9:30 AM		
10:00 AM	BREAK	Lobby
10:30 AM	**Reuse Readiness Levels**	See Room Assignments
11:00 AM		
11:30 AM	**Planning for next year**	
12:00 PM	**Making report-out slides**	
12:30 PM	Lunch (on your own)	
1:00 PM		
1:30 PM	WG Report Outs	Plenary Hall
2:00 PM		
2:30 PM		
3:00 PM	Closing Comments and Adjourn	

Reuse Breakout Agenda

- Day 1
  - Introductions and opening business
  - Discussion on “reuse” and “reusability” led by Michael Leyton
  - Discussion of Reuse Readiness Levels
  - *Invited speaker: Bill Frakes, Virginia Tech*
    - Software Reuse – Status and Future
- Day 2
  - Discussion of data life cycle issues [breakout]
  - General reuse discussion with HQ
  - Discussion of decadal survey missions and the WGs
  - *Invited speaker: Eduardo Almeida, Recife Center for Advanced Studies and Systems (CESAR)*
    - The Reuse Industry in Brazil, CESAR, and the Reuse in Software Engineering (RiSE) Group
  - Poster on RES Policies
- Day 3
  - Discussion of Reuse Readiness Levels
  - Planning for 2009 and creating report-back
- Where time permits, we will also cover: Next steps for the RES

Backup Slides